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ABSTRACT

A study was conducted in September 1981 of factors which influence the process of communication between clients and staff at six high-capacity computer facilities in the Sacramento, California, metropolitan area. These included two large government organizations, a medium-sized corporation, two bibliographic database settings, and a computer service bureau. Open-ended personal interviews were conducted with 35 clients and staff (including data processing managers, programmers, systems analysts, online bibliographic searchers, and others acting as intermediaries between clients and computer systems); and observations were made or four staff-client interactions at each facility. Based on prior research in the fields of communication, librarianship, and computer science, three classes of variables (covering organizational, interpersonal, and output relevance factors) were examined to determine: (1) how organizations define the information needs of their computer clients; (2) the characteristics of communication among participants engaged in the process of defining computer clients' information needs; and (3) the indicators used by clients and intermediaries to evaluate the quality of output received. Four additional variables found to have an impact on data processing and online bibliographic searching outcomes include source of payment for computer output, system documentation quality, intermediary personnel turnover, and the status accorded intermediaries by clients. A 41-item bibliography accompanies the description of the study. (ESR)

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ATTRIBUTES OF COMMUNICATION BETWEEN CLIENTS AND STAFF OF HIGH CAPACITY COMPUTER DATA PROCESSING CENTERS

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ATTRIBUTES OF COMMUNICATION BETWEEN CLIENTS AND STAFF
OF HIGH CAPACITY COMPUTER DATA PROCESSING CENTERS

Abstract

The communication attributes of data processing staff (e.g. managers, programmers, systems analysts and research librarians) and their clients were studied at six high-capacity centers in the Sacramento, California general area, during September, 1981. Open-ended personal interviews were conducted. Observations were made of the conferences in which staff and clients negotiated regarding the provision of data processing outcomes to satisfy clients' wants. Three variable classes were examined, chosen on the basis of theory developed from research in the fields of communication, librarianship, and computers:

(1) Organizational;
(2) Interpersonal;
(3) Relevance.

Four additional variables were discovered to have an impact on the problem definition process. They are:

(4) Source of payment for the data processing work;
(5) System documentation quality;
(6) Technical staff turnover;
(7) Status accorded to staff members by clients.

Other findings indicated that the size of a data processing organization and the degree of adherence to formal procedures affected the frequency and quality of interpersonal contacts between participants and the type of service provided by the staff (i.e. ad hoc reporting, systems analysis, and bibliographic retrieval). Frequency and quality of contacts and type of service provided, in turn, affected the definition of clients' needs.

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ATTRIBUTES OF COMMUNICATION BETWEEN CLIENTS AND STAFF OF
HIGH CAPACITY COMPUTER DATA PROCESSING CENTERS

Introduction

High capacity computer data processing centers require major capital outlay. The costs of personnel required to run the systems are also very large. Efficient use of data processing equipment requires effective communication between the clients of the systems and the technologists who operate them. These technologists--programmers, analysts, and computer researchers--serve as "intermediaries" between the clients who desire data to be organized and produced and the computer data processing equipment which does the work.

The Problem and Method:

Clients often seem to end up with less than they had hoped for from their encounters with the data processing system. Nor are intermediaries always satisfied with what they bring to their clients. The problem seems to lie in their mutual communication.

Efforts to bridge the gap between clients and intermediaries have focused primarily on improving the technological aspects of computers. That this is a human problem rather than a machine problem is becoming recognized as such by computer scientists (Vallee 1982). Some clients have been trained in the use of computers in an attempt to improve 'man-machine" interaction. However, many clients, including those who have received the training, continue to seek the aid of staff intermediaries when attempting to obtain information from a computer system (Egeland 1971). Thus computer experts continue their role as intermediary or translator between clients and computer system.

Intermediaries are admonished to do a better job of finding out clients' needs (Altman 1971, Lucas 1975). They are urged to improve the clarity of computerized output (Bimmerle and Densmore 1980).

Before attempting another try at "educating" clients or intermediaries, it seemed useful to examine and describe what type of human communication behavior actually does contribute to success in encounters with computer systems. And it seemed worthwhile to make the examination from the varied points of view of the main participants-- clients , intermediaries, and computer system managers.

To that end, six high capacity computer facilities in the Sacramento metropolitan area were visited and observed during September, 1981. Data were obtained which described how the work of data processing and the generation of information for clients took place at each organization.

The organizations visited were:

1. Two large government organizations;
2. A medium sized profit-making food processing organization;
3. One bibliographic data base setting where clients paid for computer services;
4. One bibliographic data base setting where clients did not pay for computer services;
5. A profit-making computer service company;

Thirty five people were interviewed, including those top managers who had overall responsibility for data processing and those staff and clients who were actual participants in data generation and retrieval. Each facility was visited for a maximum of two days during a two week period in mid-September. Four observations were made of the staff-client interactions at each facility.

All interviews followed the same schedule, but with specific item wordings modified slightly to fit the roles of managers, intermediaries, and clients. The interview schedule and procedures were pre-tested and modified at a local State government data processing center. All items were open-ended. (See Table 1 for the interview items.)

Table 1. Interview schedule of open-ended items. Wordings were changed slightly to accomodate schedule to "managers", "intermediaries", and "clients".

I. Organization
   1. Describe the kind of work your unit does.
   2. What is your role in the unit?
   3. What do you think are your unit's goals and priorities?
   4. Do you work with several units?
   5. How long have you been with this:
      A. unit?
      B. organization?
      C. job?
   6. Are you able to learn much about your clients' work?

II. Defining Requirements
   1. Describe, in general terms the process of defining output requirements.
   2. Are there any:
      A. procedure/guidelines?
      B. forms?
   3. Do the users have any forms or procedures you know of?
   4. How often do you typically meet during the process of defining a report?
   5. Do you communicate over the phone about your projects?
      A. how often?

III. The Meeting
   1. Describe the first meeting in general terms:
      A. long/short?
      B. how long?
      C. does anyone fill out forms?
      D. deadlines discussed?

IV. Evaluation/Feedback
   1. Do you have any system for finding out how your users react to the product or system you delivered?
   2. What might be done to improve the results?
   3. What might be done to improve the process?

The observations of meetings between intermediaries and clients supplemented interview data. They also enabled a check of the correspondence of interview responses with actual behavior. There was high correspondence. Following completion of the interviews and observations, informal content analyses were conducted on the open-ended responses. This is a report of the findings.

Theory

The central human activity which initiates the process of obtaining data from high capacity computer systems involves one or more interviews between someone knowledgable with the system and a client for whom the data will be generated. This interview--human communication process has not been the object of systematic study within the computer--data processing industry. But it has been studied for decades within the field of librarianship. Reference librarians have to deal with the problem of clarifying their clients' information needs and matching those needs to the appropriate information resource. The process is known as "conducting the reference interview(s)", in which "reference questions" are asked of clients by reference librarians.

Use of the term "reference question" is found as early as the turn of the century in Rickey (1899) and Mudge (1902). Wyer (1930) identified three factors involved in reference interviews:

(1) the inquirer;
(2) the reference librarian;
(3) the source of materials.

Hutchins (1944) distinguished between the reference question, the reference interview, and techniques and methods of answering reference questions.

Taylor (1968) provided an analysis of the reference interview which described the dynamic, open ended nature of question negotiation, identified four levels of information need, posited the existence of five filters through which a question passes, and stressed the importance of negotiating the original question posed by the client to fit the file structures of the library.

The characteristics of reference interviews are functionally identical to the communication process which takes place when a client seeks to obtain information from a computer facility with the aid of a technical intermediary (Carmen 1975). Thus, the theoretical basis for this investigation of human communication practice within the context of computerized information seeking was derived from research findings of the related fields of library science and organizational communication.

The position occupied by intermediaries in regularized communication situations is more powerful than might seem apparent. Intermediaries are thought crucial to the functioning of their system by clients in a wide variety of settings. For example, shamans are considered essential intermediaries between ordinary people and the Gods in several "primitive" North American Native Indian tribes. In the more "modern" Christian Roman Catholic religion, priests are considered to be intermediaries between parishioners and God. In Soviet Russia, the position of greatest political power--Communist Party "Secretary"--is an extension of the intermediary position. This circumstance derives from Joseph Stalin's transformation of a low level clerical position into the key to his achievement of absolute rule over the U.S.S.R. (Payne 1965).

The analogy between these diverse examples of communication intermediaries and the intermediaries who serve in high capacity computer information facilities has to do with knowledge differences which lead to differences in the way computer people and non-computer people treat each other. Though they try hard to be clear, too often technically oriented people who serve in intermediary roles withhold information and confuse their clients while operating on the perception of themselves as giving out good, technical information. What they sometimes miss is that the technical information may be beyond the understanding of their clients.

The problem has been attacked within the data processing industry by attempts to "educate" clients in order to upgrade their knowledge of computer systems. The attempt is made to inform clients with knowledge of what the systems can do easily and what requires resources beyond the norm. Another goal is to get clients to prepare themselves better by coming to a clear understanding of their own needs.

Data processing centers occasionally try to "educate" clients via a flow of memos giving the information required to adjust to changes in the systems and to use new procedures. These attempts are often undercut by two characteristics of complex information environments:

(1) Computer data processing procedures and structures change more rapidly than do the other parts of an organization. Therefore, the occasional attention seeking announcement becomes instead a splash among many in an unending, blurred stream of change--announcements;

(2) The stream of announcements is further obscured by the huge river of printed announcements, memos, and "information" coming from other departments of the organization.

Research Questions

Three general research questions were explored in this research project:

(1) How did organizations define the information needs of their computer clients?

(2) What are the characteristics of the communication among participants engaged in the process of defining computer clients' information needs?

(3) What indicators are used by the clients and intermediaries to evaluate the quality of the output they receive?

Variables

Three classes of variables were examined:

(1) ORGANIZATIONAL (structure and size, type of data processing service, procedures used for finding out what clients desired, cost-of-use charge procedures, paper forms and formal procedure use, and organizational goals.)

(2) INTERPERSONAL (interaction between intermediaries and clients, type and amount of probing used by intermediaries in the encounters, amount and informational level of discussions between clients and intermediaries, amount and technical level of clients' knowledge of computer systems, and amount and technical level of intermediaries' knowledge of clients' subject areas of inquiry.)

(3) RELEVANCE (timeliness of job completion, accuracy of information output, completeness of the supplied information, and overall client satisfaction with the work.

Four additional variables were discovered to have an impact on the outcomes:

(4) WHO PAID FOR THE WORK;
(5) SYSTEM DOCUMENTATION QUALITY;
(6) INTERMEDIARY PERSONNEL TURNOVER;
(7) STATUS ACCORDED INTERMEDIARIES BY CLIENTS.

Findings

ORGANIZATIONAL VARIABLES

Structure -- Size: Of the six organizations visited, two employed over one hundred people in data processing and were considered large. One organization employed twenty seven people and was considered medium in size. The remaining three organizations had less than ten employees working with computers. Organizational size appeared to relate to how an organization defined the information needs of its clients. Large organizations tended to have more administrative procedures than small ones. Organizational size also seemed to have some relationship to what took place during the interpersonal process of defining clients' information needs. In the two large organizations there was less social contact between clients and intermediaries than in the medium and small organizations. There appeared to be no relationship between organizational size and bibliographic data base searching. Similar processes for determining needs were employed in each of the bibliographic libraries.

Type of Service and Frequency of Meeting: The type of service provided by the organization had some effect on how organizations defined their clients' needs. The two bibliographic libraries had standard procedures that involved a maximum of two meetings with their clients. The information needed by bibliographic data base clients was analogous to the type of questions asked of librarians, and the intermediaries were all trained librarians. Intermediaries at the data processing service bureau met with clients less frequently during the client needs assessment phase, but the meetings were longer than those found in other organizations. Government agencies met more often while defining clients' information needs. The meetings usually lasted about one hour.

Procedures: The procedures employed by organizations affected how information needs were defined. It was found that larger organizations employed more administrative procedures that governed whether or not a process would be initiated. Administrative procedures in bibliographic data base settings served primarily to screen out ineligible searchers or to record charges for services. The two profit making organizations employed very few procedures to guide the process. While one had no formal procedures, the other had only a formal procedure for settling disputes when the data processing unit felt a project should not be undertaken. Only one organization, CALTRANS, had any guidelines to aid intermediaries in discovering clients' needs. These guidelines were sketchy and provided no formal structure to the process. It appeared that even this procedure was rarely used.

Charges: Three methods were identified for covering the cost of operating the computer. They were:

(1) charge the client directly;
(2) charge the client's unit account;
(3) absorb the costs in the intermediary's unit.

Method one, charging the client directly, was found to be the practice in one of the bibliographic settings and in the computer service bureau. Method number two, charging the client's unit account, was used in each of the organizations that had their own data processing units. The method of not charging the client was unique. The bibliographic organization was specially funded by a legislative body to provide research services.

Forms -- Procedures: Forms were used by five of the six organizations to record data about clients' information needs. In the case of government organizations, a form was used primarily to describe the objectives of the work rather than to serve as a guide for discovering the clients' information needs.

While four of the six organizations were found to have both low levels of administrative and interview procedures, the two government organizations were found to have high levels of administrative procedures. Five organizations appeared to have low levels of formality during the process of defining clients' information needs. These organizations had some formal procedures but they were not strictly adhered to. One of the government organizations had formalized procedures and attempted to enforce adherence to those procedures.

Goals: Although only one of the organizations visited provided a formal statement of goals, there appeared to be a high level of agreement among managers and intermediaries regarding the units' goals in all six organizations.

There also appeared to be high levels of congruence between clients' and intermediaries' perceptions of the goals of the intermediary--client unit. The consensus was that the function of the data processing section was to serve the information needs of its clients.

INTERPERSONAL VARIABLES

Question Negotiation -- Interaction: The amount of interaction required to define a client's information needs appeared to be related to the type of service sought from the intermediary. Requests made of bibliographic intermediaries were reported to require a

maximum of two meetings to complete the definition of the problem. In organizational settings the type of request was also related to the frequency of interaction. The number of interactions ranged from one meeting (for a change on a program) to hundreds occuring over the life of a five year project. There appeared to be no necessary relationship between the frequency of interactions and client satisfaction with the results.

Question Negotiation -- Probing: There appeared to be a relationship between the amount of probing and the outcome of the process. When the intermediary lacked familiarity with the data or the program to be used or the client was unclear about his/her information needs and little probing took place then the results were generally unsatisfactory. In at least one government organization intermediaries reported feeling constrained from probing because of the "conservative" nature of the organization.

In the bibliographic settings there appeared to be high levels of probing. This was attributed, in part, to the inclusion of training in the reference interview as part of a librarian's curriculum.

In one organization there appeared to be low to medium probing, but clients reported high satisfaction with the intermediaries' services. The size of the organization permitted the intermediaries to know many of the clients on a first name basis and to know their work as well. This apparently had two effects;

(1) less probing was necessary, and
(2) when needed, probing was easier to accomplish.

Question Negotiation -- Discussion: The amount of discussion during the process seemed to be related to:

(1) the intermediary's skill at probing,
(2) how well the client was able to express the need,
(3) the frequency and quality of previous interaction between the participants, and
(4) the subject matter of the search.

In the bibliographic settings, when the participants had had good past interactions, subsequent sessions took very little time, required little discussion or probing, and were frequently conducted over the telephone.

Where the intermediary did not know the subject matter, was unfamiliar with the way a program worked, or was unclear about the purpose for the request, the discussion tended to be lengthy. The amount of discussion alone was insufficient to affect the outcome of the process. It appeared that the intermediary's skill at drawing information out of the client and the clients' willingness to reveal their real information needs (or to discover their needs) were more important factors.

Shared Knowledge -- The Client: Few of the clients had formal training in computers. However, most had gained some knowledge of the limitations and capabilities of computers through their jobs. Clients were familiar with the impact their requests had on intermediaries work activities. The effect on the process of clients having formal training in computers was generally favorable. Those clients with the training felt it made their role as client easier. Several of the clients expressed a desire for more training and felt it would aid them in their work.

The client of the bibliographic computer noted that his knowledge of the capabilities and limitations of computers caused him to mistrust the results of the search. He added, however, that despite his mistrust the results were still acceptable and better than what he would have gotten if he had instead obtained references from printed reference sources.

Shared Knowledge -- The Intermediary: The knowledge intermediaries possessed about the client's work appeared to affect the outcome of the process. When the intermediary knew very little about the use of the output to be generated, discussions took longer, more probing was

required, and more meetings were necessary. Where information about the use of a report was denied the report was usually unsatisfactory.

In data processing settings, intermediaries and clients alike agreed that it would be helpful for intermediaries to spend time working in clients' organizations. In one situation, a five year development project, the intermediary maintained a desk in the clients' office. The client felt that having the intermediary was a critical factor in the success of the project.

RELEVANCE VARIABLES

Timeliness: The ability of intermediaries to deliver reports on time appeared to have little affect on the client's judgement of relevance. Several clients noted that intermediaries were well known for not delivering products when promised and that late reports were not usually a factor in rating the intermediaries' services. Reports appeared to be delivered when promised in bibliographic settings but there was a delay of several days to a week in getting the printouts to the client.

Accuracy: Several clients pointed out that creating accurate reports was what computers did best, and they rarely had complaints about accuracy. However, several of the clients noted that they continued to do random checks of data for accuracy. Accuracy did not seem to be a factor in bibliographic settings.

Completeness: Clients in bibliographic settings tended to be more concerned with completeness than in the other settings. This appeared to result from the clients' lack of knowledge and control over the contents of the data bases. They were never certain that they were getting everything that was appropriate to their questions.

In organizational settings, clients tended to have more knowledge and control over their data sources and were more confident that the reports they received were complete.

Client Satisfaction: Overall, clients seemed to be satisfied with the quality of services delivered by their intermediaries. In the large government organizations, clients expressed misgivings about the intermediaries' knowledge of their operations. One client expressed sympathy with the intermediary's plight of being responsible for programs yet not knowing who wrote them. Dissatisfaction with the intermediaries' services appeared to be attributed to organizational barriers that prevented the participants from communicating.

OTHER VARIABLES

Several other variables were uncovered in the course of this investigation that appeared to affect the process of defining computer clients information needs. These were costs, documentation, and turnover in personnel.

Costs: Who paid for the use of the computer seemed to have an effect on the process. Clients in one bibliographic setting were required to pay for the use of the computer, which appeared to constrain them. In the non-paying bibliographic setting the fact that the online searching services were free appeared to encourage lengthy and more comprehensive searches. The type of output the client received also appeared to be affected by who paid for the search. The for-pay bibliographic sites also provided printed materials to clients explaining their services and how to make a request while the non-pay bibliographic site did not.

There appeared to be a difference in the interaction of participants at the government organizations, at the private food processing organization, and at the computer service bureau. The intermediaries in government organizations met more frequently with their clients' to define the clients' information needs. It was not clear, however, if this was due to the complexities of the projects or the result of organizational dynamics. Government

intermediaries seemed less able to plan for future projects and set priorities than intermediaries at private enterprises. In short, government organizations appeared to be less capable than private enterprise in managing the process of defining their information needs and then developing systems to meet those needs.

Documentation: The lack of documentation (narrative description) of a system or program appeared to affect the process in large organizations. Intermediaries in large organizations expressed a need for documentation of how and why their programs were written and to know how changes in the programs would affect the operation of other programs. Where documentation was lacking, the intermediaries were required to spend additional time with clients trying to get answers to those questions. If the answers were unavailable or unobtainable, intermediaries were at a disadvantage when discussing changes to existing programs or when discussing the development of programs to replace older ones.

Personnel Turnover: High turnover in intermediaries were reported in the large government organizations. Managers in both organizations reported that many intermediaries had less than two years experience in their present jobs. The turnover appeared to have an undesirable impact on the process of defining clients information needs because of the long length of time needed to understand the way programs and systems were used. The amount of time an intermediary had been working with a client was apparently related to the intermediary's knowledge of:

(1) the client's programs, and
(2) the client's work.

Knowledge of these two factors could be gained through experience with the client and reading documentation that explained the program's operation. Adequate documentation did not exist in the large organizations so the intermediaries had to rely on their experience with clients. Frequent turnover in intermediaries meant less experience with clients which thereby reduced the effectiveness of this approach.

Attitudes: Librarians and bibliographic searchers appeared to be deferred to as experts with privileged knowledge and were generally held in high esteem by clients. Programmers and systems analysts also appeared to be regarded as possessing expert knowledge. However, clients in data processing settings did not seem to defer to programmers and systems analysts as persons with expert knowledge. Rather, data processing clients seemed to perceive their intermediaries in subordinate roles.

Summary of Findings:

ORGANIZATIONAL VARIABLES

1. In large organizations data processing managers needed to know, in advance, the type and amount of services required of their personnel.

2. Intermediaries and clients tended to dislike the use of forms and procedures. Where they existed the participants appeared to only tolerate them and tried to circumvent or avoid them whenever possible.

3. In organizational settings clients were more likely to approach the intermediary with a firm idea in mind about exactly what was needed.

4. When intermediaries produced exactly what was requested with little discussion or negotiation, it was not unusual for the client to be dissatisfied with the outcome.

5. Intermediaries in large organizations tended to be cut off from their client's work and subsequently had a difficult time being knowledgeable about the use of the programs and/or systems they designed and maintained.

6. There was less interpersonal communication between clients and intermediaries under the conditions described in Finding #5. However, the participants acknowledged the importance of communication.

7. Intermediaries in smaller organizations had more interpersonal communication with clients.

8. Clients almost universally perceived that the intermediaries' role was to provide service.

9. Two of the organizations had some form of post-implementation review but in practice the procedures were never invoked.

10. The type of service provided by the intermediaries' organization influenced the process of defining computer clients' information needs.

INTERPERSONAL VARIABLES

1. The more intermediaries knew about clients' problems and the better they understood clients' needs; the greater the likelihood that programs and systems would be provided that adequately met those needs.

2. Intermediaries frequently lacked sufficient familiarity with the uses of their systems.

3. The more specific clients were about their needs, the greater the likelihood that intermediaries would deliver the desired result.

4. Searches conducted in scientific or technical data bases for professionals, researchers, or technicians who also worked in those fields, were generally easier to perform and produced more satisfactory results.

5. Clients generally did not understand computers or the functions of intermediaries.

6. Clients demonstrated little understanding or appreciation of the complexities that outwardly insignificant changes could impose on a system.

7. Few clients had received formal training in computers. Three of the clients had received some college level courses in either computer languages or data processing concepts. The three clients with formal training were either accountants or auditors.

8. Probing for more information by intermediaries was found to be more characteristic of bibliographic than data processing settings. An exception to the data processing finding was the computer service bureau. Probing to find out what was needed by clients was important to this organization because, unlike the other data processing organizations, service bureau clients were individuals outside the intermediaries' organization. A variety of organizational factors such as size, structure, participants organizational role, and organizational attitudes about the function of the data processing unit served to constrain the intermediaries from probing.

RELEVANCE VARIABLE

1. Feedback from clients usually took the form of a complaint when a system or program failed to operate properly.

OTHER VARIABLES

1. There was a high rate of personnel turnover in many data processing organizations.

2. Charging clients for the use of the computer affected the negotiation process. In bibliographic settings, when clients were required to pay for the searching, there was significant concern about the cost of searching. In bibliographic settings, when clients were not required to pay searching costs, the negotiation sessions took longer and were generally more comprehensive. When clients were paying for services they were willing to accept less perfect results.

3. Useful documentation of programs and systems was practically non-existent. Each organization expressed awareness of the documentation problem but none had a solution.

Findings Pertinent to Research Questions:

HOW DID ORGANIZATIONS DEFINE THE INFORMATION NEEDS OF THEIR COMPUTER CLIENTS?

Organizations defined the information needs of their clients in the following ways:

1. Large organizations tended to have written guidelines for the participants to follow.

2. Large organizations had administrative procedures to control the process of approval/denial of requests for work.

3. Smaller organizations had less structured procedures and guidelines or none at all.

4. Organizations providing bibliographic data base services had guidelines and procedures but had almost no administrative approval constraints.

5. Charging clients for the cost of searching in bibliographic settings appeared to diminish interaction among participants.

6. Profit-making organizations approached the process with less concern for adherence to administrative procedures than government organizations. It should be noted, however, that the profit-making organizations studied were small in contrast to the government organizations which were large.

WHAT ARE THE COMMUNICATION CHARACTERISTICS OF THE PARTICIPANTS IN THE PROCESS OF DEFINING COMPUTER CLIENTS' INFORMATION NEEDS?

We found the following communication characteristics shared by the participants of the process:

1. Information needs were almost always discussed in face-to-face interactions, usually in the clients' work areas. Exceptions were found in bibliographic settings where clients came to the intermediaries' work spaces or where the interview was conducted over the telephone.

2. Determining the clients' information needs involved probing on the part of the intermediary.

3. Face to face interactions took from one half hour to two hours for the first meeting.

4. Communication during the process could be characterized as iterative. That is, there was frequent restatement of the client's question or need. The goal of this activity appeared to be:

   a. to provide the intermediary with a better understanding of the client's problem and
   b. to arrive at a solution for solving the problem. Factors such as cost, time, workloads, interpersonal conflicts, and social/organizational barriers inhibited the completion of the process.

5. Communication usually took some form of dominant-subordinant interaction. In non-profit data processing settings intermediaries usually appeared to be in a subordinate role. In bibliographic settings the roles appeared to be reversed; i.e. clients were in the subordinate role. Participants in the process in profit-making organizations tended to approach the process as equals.

WHAT INDICATORS ARE USED BY THE CLIENTS AND INTERMEDIARIES TO EVALUATE THE QUALITY OF THE OUTPUT THEY RECEIVE?

The following indicators were used to evaluate the output received by clients:

1. Delivering output when it was promised seemed to be a factor employed by clients to evaluate quality. When output was not delivered on time or deadlines not met some clients became dissatisfied

2. Clients responded that accurate output was the rule rather than the exception. Several client still checked reports for accuracy, indicating that accuracy was a factor in judging quality

3. When reports were delivered that were incomplete clients expressed dissatisfaction. When systems did not have all the characteristics clients expected they were dissatisfied.

Discussion of the Findings:

Organizational Variable Finding #5 indicates that intermediaries in large organizations tend to be cut off from their clients' work and consequently have a difficult time being knowledgeable about the programs and systems they are required to support. This finding, when combined with Organizational Variable Finding #7, indicates that where intermediaries and clients work closely together both are more satisfied with the work done by the intermediary. Knowledge gained through close working arrangements also helps intermediaries to anticipate future needs and addresses the need expressed by managers in Organizational Finding #1, which stated that managers needed to know, in advance, what was going to be requested in the future in order to plan. Intermediaries who work closely with clients are in a better position to predict the future needs of clients.

The existing research, reviewed above, focused on interpersonal and procedural variables that influenced how clients and intermediaries would interact. Taylor (1968) focused mainly on the effects of steps leading up to the interview and interpersonal influences. Carmon (1975) focused on the interpersonal variables. Both researchers were concerned with the process in a literature searching (bibliographic) setting. It is now clear that organizational size is an additional factor affecting interpersonal communication. In small organizations there appears to be more frequent social, as well as professional, interaction. Large organizations have more administrative and procedural controls that the participants must follow. It seems that these procedures, while providing control and information to the managers of the organizations, act as inhibitors of interpersonal communication between the participants.

Probing was found to be an important ingredient in the process of defining information needs. Intermediaries who were librarians or bibliographic data base searchers tended to probe more than intermediaries in other settings. This finding suggests that there are both organizational and interpersonal constraints as well as factors in training that effect probing. The previously mentioned strategy of putting the participants into closer working relationships would help to eliminate some of the organizational interpersonal barriers to probing. Training for programmers and analysts in the interpersonal skills necessary to become effective intermediaries would be a helpful addition to the curricula of computer science departments.

There appears to be a fundamental communication -- control difference between the use of computers in bibliographic and data processing settings. In a bibliographic setting the client has very little control over the contents of the data base being searched, the strategy used to search, or the way the search results will look. On the other hand, clients of organizational computers usually have some control over the data they wish to use. And they possess expert knowledge about its contents and the way reports from the data base should look.

Intermediaries in the data processing setting performed different functions from intermediaries in the bibliographic settings. In General, the definition functions performed by intermediaries fall into three categories:

(1) defining information needs;
(2) defining the requirements for a modification to an existing system;
(3) providing management information reports for organizational decision making.

Of these three types of definition functions in data processing settings, the first most closely resembles what intermediaries who work in bibliographic settings perform. However, organizational intermediaries, unlike librarians, are not trained to seek out their clients' needs. Also organizational barriers frequently prevent them from asking the necessary questions.

A related finding concerned the problem of dominant-subordinant communication roles. It was particularly interesting to find that intermediaries in both types of settings were perceived as having expert knowledge about the computer. However, bibliographic setting intermediaries were held in high esteem while organizational intermediaries were viewed as being in a subordinate, service-oriented role. This finding could be attributed to several factors. One factor is the ownership and knowledge of the data. In a library the intermediary is the expert about not only the data contained by the system but also on how to search the system. In organizations the client usually has the expert knowledge of the contents of the data base and in some cases jealously guards that knowledge. Another factor could be the fact that programmers and analysts are a relatively new job functions in organizations. The data processing units of most organizations originally developed as small units within accounting, administrative, or business divisions and are rarely found to receive recognition proportionate to their current importance to the organization.

Dominant-subordinate communication practices are not always synonymous with effective communication. The elevation of data processing managers to the highest levels of organizational management might help balance the communication roles. Creating systems of joint ownership of systems, as mentioned before, would also help to create a climate more conducive to effective communication.

This imbalance also suggests a redirection of training for intermediaries toward the art of question negotiation as practiced by librarians.

A paradox uncovered by this study is that many intermediaries in data processing settings have responsibility for systems yet they do not feel any ownership of these systems. They are prevented from feeling ownership by the organizational barriers to interpersonal communication.

Future Research

Of central importance is the dominant-subordinate struggle between clients and intermediaries. Moore, et al, (1977) suggest modeling peer and superior/subordinate dialogue in order to improve our understanding of man-machine communication. We suggest there is a need for similar study of the person-person communication that precedes man-machine communication.

Research should examine the types of information needs of clients and their correlates.

Longitudinal studies of the ways clients and intermediaries interact in various organizational settings would contribute to our knowledge of how the process differs across time.

Conclusion:

Intermediaries can be trained in the art of better communication with their clients and organizations can create climates more conducive to effective communication. Intermediaries in organizations would do well to study the practices of librarians as a first step in learning how to find out what computer generated data would best satisfy their clients' information needs.

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